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EUROPE

TRANSLATIONS ON CZECHOSLOVAKIA

GUO No. 837

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CONTENTS PAGE

Use of Magnetic Fields and Electronic Noise in Treatment of Insomnia and Neuroses
(O. Gruenner; CESKOSLOVENSKA NEUROLOGIE A NEUROCHIRURGIE, Jan 76) 1

SCIENTIFIC ABSTRACTS

Computers: Digital 18
Miscellaneous 19

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USE OF MAGNETIC FIELDS AND ELECTRONIC NOISE IN TREATMENT OF INSOMNIA AND NEUROSES

Prague CESKOSLOVENSKA NEUROLOGIE A NEUROCHIRURGIE in Czech Vol 39 (72), No 1, Jan 1 pp 1-11

[Article by O. Gruenner, of the Balneological Research Institute, Prague, director: MUDr J. Benda, CSc., Third Clinical Work Center of the Balneological Research Institute, Jesenik Spas, chief: MUDr O. Gruenner, CSc. [Article published on the occasion of the 60th birthday of Academician Jaromir Hrbek]

[Text] Efforts to utilize the effects of magnetic phenomena on human organism are becoming more and more the center of interest on the part of physicians. Among types of practical application, one can mention the use of the magnetic field in the therapy of Dupuytren contracture, in influencing edema which appears following an accident, in acceleration of the formation of callus in cases of fractures (5), and also in the treatment of hypotonia, arthritic difficulties, infected wounds, and last but not least, in influencing the progress of malignant tumors (35). Studies have been made recently of the effects of natural magnetic fields on biological systems, including the human organism, and especially on the human mind (4, 7, 8, 29, 30, 33).

First Experiments

Data contained in all these studies have given us the idea that there must exist structures in the organism which record the magnitude and oscillations of electromagnetic activities. In order to confirm this concept, we made the first two studies.

In the first evaluation, we observed for a period of 197 days an open group of neurotics, which on the average consisted of 40 persons. On the basis of data obtained from the Geophysical Institute in Prague and from the Astronomical Institute in Ondrejovice, we were able to evaluate each day of study as a day which showed minimal or average or increased geomagnetic activity. Each day at 0700, the neurotics were asked about whether they

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felt generally comfortable both at the given time as well as in comparison with the previous day. They answered questions as to whether they felt in an excellent condition, average condition, or poorly, and also whether they felt better, the same way, or worse than the previous day. The results obtained were correlated with the established levels of geomagnetic activity and especially with an evaluation of the increasing or continuously decreasing characteristics of the atmospheric pressure and with the relative humidity. This was done always during the same period of 24 hours which preceded the information obtained from the patient. The relationship of the intensity of neurotic difficulties was established with regard to all three criteria under study, significant relationship with regard to the values of the atmospheric pressure and to the values of geomagnetic activity. The established sequence of significant relationships indicates that geomagnetic activity plays a role in influencing the intensity of neurotic difficulties directly and not indirectly through other bioclimatic components (19) (Chart 1).

In the second experiment, we tried to learn more details about these structures which can record various periods of electromagnetic activities and electric currents. In order to do that, we applied experimentally electronic noise (f = 5 cycles per second to 30 kilocycles per second) by means of our instrument (ELECTROREL GJP). According to the usual concepts, which in addition were interpreted to us in the form of an opinion of an expert (37), this electronic noise is electrophysiologically quite ineffective and at the most can have an effect which would be equal to the diathermic effect. However, by using this electronic noise (f = 5 Hz-30 kHz) in cerebral application with I ef = 22 mA, we brought about electronarcosis of a rabbit (Figures 1, 2, Charts 1, 3, 4) and we demonstrated that this electronic noise passes through inner structures of the brain. As it is well known, electronic noise is the source of rendering at random sinus signals of electric activity. Such signals should indeed be ineffective in this random distribution, if there was no mechanism in the organism and especially in the inner structures of the brain through which the signals pass, which would eventually make it possible to coordinate these signals. We assume that such mechanism exists in indirect or direct semiconducting structures of the brain (3, 26, 36). It is possible that we are dealing here with identical structures which are also influenced by a constant or modulated field (9-20).

In those cases where the mind and the structures of the central nervous system are influenced by electronic noise and by various types of magnetic fields of low intensity, we are always dealing with relatively insignificant stimuli, and the reactions of the organism cannot be explained unless the original signal has been first biologically amplified. This common assumption of the effect is the reason why in this article we combined the effects of electronic noise and magnetic fields.

Material and Methodology

As soon as we have established in our studies that electromagnetic waves and fields have an effect on the living organism and on the mind of human

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personality, we proceeded with the actual series of clinical experiments. In a total of four experiments, we studied the reaction of neurotics suffering from insomnia to the administration to the patients of electronic noise as well as of a constant magnetic field. In evaluating these effects, we studied both the changes of vigilance according to reports given by the health worker as well as by the patient himself. In addition, we made objective tests by evaluating changes of electric conductivity of the skin (EKV) or electric resistance of skin (EKO). The results of all these evaluations were always compared with the results of the simulated procedure in which the arrangement was otherwise quite identical.

We evaluated the EKO by using circular electrodes made of silver (r = 0.7), which we placed with the usual precautions at the distance of about 9 centimeters from each other at symmetrical points of the forehead. We measured the EKO at first while direct current with voltage of 1 V was passing through by means of a Wheatstone bridge, and later on we used a RLC [expansion unknown] measuring instrument manufactured by Tesla with a built-in bridge system. We gave the resulting values in kilo-ohms of resistance. When we studied EKV, the values were converted to millisiemenses. In view of the well-known oscillations of basal values of EKO, which is considerable, we studied in each case -- just like Mastny did together with Habanec (27) -- only relative changes, that is, the relative increase or decrease of EKO in the course of the actual or simulated procedure in relation to the values obtained before the procedure was initiated or at the beginning of it. The method which we used consists in manifestation of the psychogalvanic phenomenon. It is so sensitive that it reacts in the form of individual change of EKO even to the assignment of a mathematical problem in relation to the degree of its difficulty or in relation to the level of attention and emotional stress of the patient.

The magnitude and the time course of the EKO depends on many factors: on the content of electrolytes of water in the skin, on skin hydrotachia (21-25), on the innervation of the secretion epithelium of perspiration glands (42), on the ergo- or trophotropic orientation of the organism (39, 40), on the participation of diencephalic hippocampo-amygdaline and neocortical intermotoric areas (41, 34).

While Klimkova-Deutschova and Lesny used for the purpose of evaluating sensitive as well as vegetative disturbances the dermatoforetic method which examines changes in the conductivity of the skin at the initial stage of organic changes or during long-term organic changes, in professional disturbances of skin trophicity, during an evaluation of the vegetative system, our efforts concentrated on evaluating the relative changes of the EKO concentrated on the idea of determining the changes of the level of vigilance. We used above all reflex phenomena which originate from the highest areas of the neokortex and from limbic areas (43).

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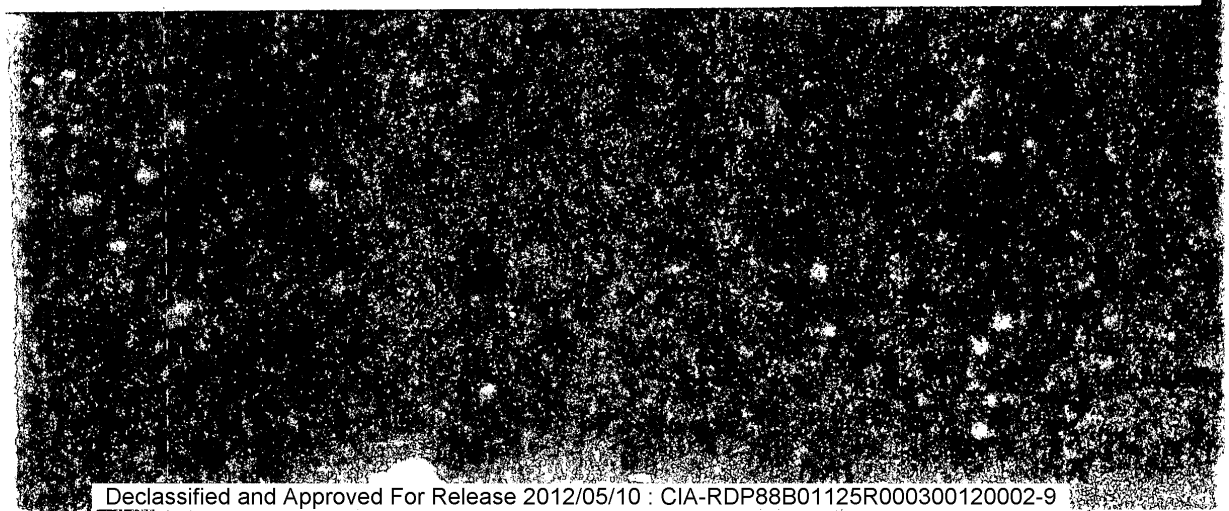

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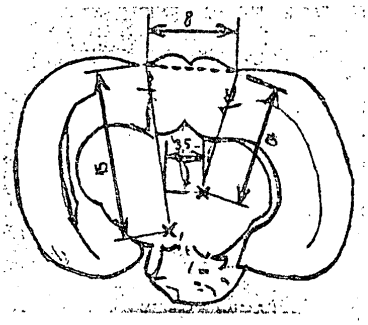

Diagram 1. Location of insertion of needle-shaped electrodes which record electronic noise in inner structures of rabbit's brain (X = points of insertion).

Results

1. In the first series of experiments, we applied three procedures to each patient in a group of 21 neurotics suffering from sleeplessness. Electronic noise (ESM) or impulse current were administered cerebrally to all the patients for a period of 1 hour. In both cases, the electronic noise or impulse currents were superimposed on a constant unidirectional component. The patients believed that the same procedure was applied in each case. By evaluating changes in vigilance and also by evaluating changes in the EKV after the procedure as compared to the condition existing prior to these procedures, we have established that there was a significant difference between the effect of both procedures of the actual electric treatment as compared to the simulated administration of the treatment (Chart 2). However, in applying electronic noise superimposed on the constant unidirectional component of the current by means of the instruments ELECTROREL GJP, no significant changes take place in the sense of changes of the EKV in contrast to the administration of an impulse current. During subjective evaluation of sleeplessness and the time when the patients fell asleep, the study of this group did not demonstrate any significant difference between the two methods of actual cerebral electrotreatment (13).

2. Using a method which was entirely identical, we evaluated the mutual relationship of the procedures in an additional series of 23 neurotics suffering from insomnia. This time, we applied pure electronic noise by means of our instrument ELECTROREL GJP at the level of I ef = 5 mA without any superimposition. In the this experiment, when we compared the changes in vigilance and also when we examined objective changes in the EKV, we

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had established that there was a significant difference between all these three procedures (Chart 3). The most effective procedure was the application of mere electronic noise by means of the instrument ELECTROREL GJP. Next in terms of efficiency is the effect of the impulse current superimposed on the constant unidirectional component by means of ELECTROSON 2. The least effective procedures was the simulated treatment. Among secondary phenomena resulting from the administration of electronic noise, we recorded in the case of seven patients their report that they felt tingling in the hands and in the neck. However, this sensation stopped after the procedure within 10-15 minutes. It was established that after application of pure electronic noise by means of the ELECTROREL GJP, the EKV decreases, (that is, the tonus of the parasympathetic nerve increases) during all the minutes of the study. This decrease reaches the maximum value as compared to the other two procedures, and the difference is significant. However, after the procedure had been completed, we observed that the EKV showed the fastest increase when electronic noise was applied. This finding agrees with clinical observations, when patients after application of ELECTROREL GJP report soon a feeling of pleasant freshness and desire to be active (20).

3. In the third series of experiments we observed longitudinally -- at this time within the period of three weeks -- the effects of application of electronic noise superimposed on the constant unidirectional component in the case of three patients. At this time, we used the instrument ELECTRODORM 2. The procedures were followed every second day. We applied a total of 112 procedures to the patients, of which 80 were actual procedures and 32 were simulated ones. We have established that there was a significant difference in the effects of both procedures. We studied again the beginning of sleepiness and the beginning of sleep, and we also made evaluation by means of the EKO. This evaluation of the electronic noise, superimposed again in this case on the constant unidirectional component, established once more that the changes in vigilance and the beginning of sleep were signficantly more pronounced than in the case of administration of the simulated procedures. In the same way, changes of the EKO indicated an increase of the tonus of the parasympathetic nervous system and were clearly different from the administration of the simulated procedure.

With regard to the fourth group of 59 neurotics suffering from insomnia, we also applied for a period of 1 hour a continuous homogenous magnetic field by means of the instrument MAGNETOREL 1 (Figure 3). The source of the constant magnetic field consisted of a system of three quadrangular coils with a side 70 centimeters long. All the coils were the source of a constant homogenous field measuring 0.73 Oe. The head of the patient was placed in the center of that field. During the real procedure, we could observe an increase of the EKO in the cases of 50 patients, a decrease of the EKO in the cases of 8 patients, and in the case of 1 patient there was no change in the EKO. In the course of 1 hour on another day, when the simulated procedure was applied, the EKO increased in the cases of 21 patients, it decreased in the cases of 35 patients, and in the cases of 3 patients the EKO did not change. The real as well as the simulated procedure were applied alternately as the first or second procedures to each patient.

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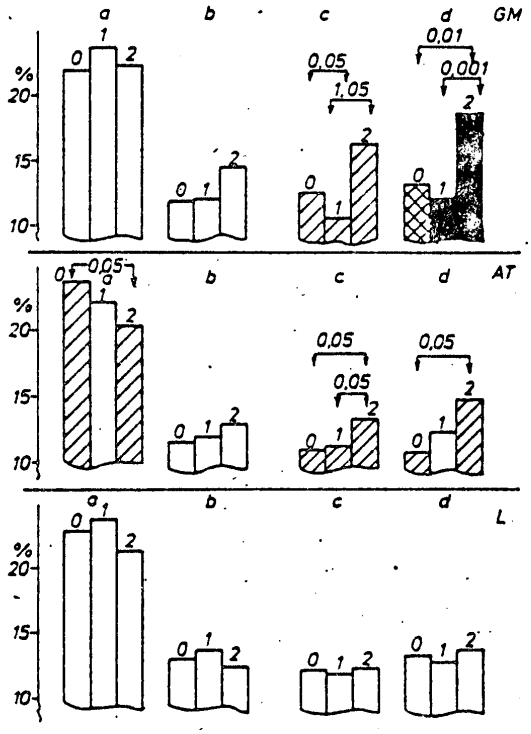

Chart 1. Effects of some components of the climatic complex on difficulties suffered by neurotics (during 197 days of observations).

Legend: GM — geomagnetic climatic complex. AT — complex of atmospheric pressure. L -- complex of relative humidity of the air. a — Percentage of patients who felt better than on the previous day; b — percentage of patients who felt excellent; c — percentage of patients who felt worse than on the previous day; d — percentage of patients who felt poorly. 0-1-2: evaluation according to individual criteria. With regard to GM, 0 means minimal changes of geomagnetic activity, 1 means average changes of geomagnetic activity, 2 means great changes of geomagnetic activity, geomagnetic storms. Empty columns: insignificant mutual relationship, dashed column: significance at the 5 percent level; twice dashed column: significance at the 1 percent level, black column: significance at the level of 1 per 1,000.
Geomagnetic complex shows the most important levels of significance — this component is the leading component in the entire climatic complex (with regard to the effects of climate on the patient).

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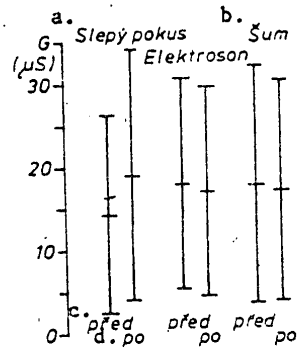

Chart 2. Legend under the diagram [sic] (This diagram was taken from my published study: "Cerebral Electrotreatment" of 1972).

Key: a. Blind experiments, b. noise, c. before, d. after.

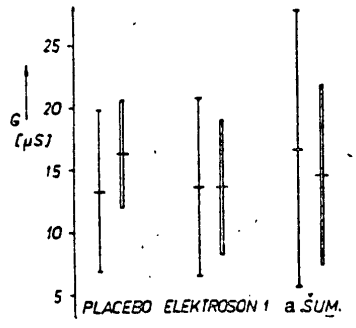

Chart 3. The average value and dispersion of conductivity with regard to all the patients during individual procedures, that is, during the blind (control) experiment, during the administration of Electroson, and during the administration of electronic noise. It is only in the case of application electronic noise that we observe a decrease of conductivity after completion of the procedure (column) as compared to the values prior to the procedures (full line).

Key: a. Noise.

It is clear that when the actual procedure is applied, there is an absolute preponderance of cases showing an increase of the EKO. This difference in the number of increases (or decreases) of the EKO, when evaluated according to X^2, is significant at the 1 percent level.

It is known that an increase of the EKO (or a decrease of the EKV) corresponds to the decrease of vigilance and irritability, at which time there appears the first symptoms of dampening and the tonus of the parasympathetic nervous system increases. The patients become sleepy and go to sleep. We also found that immediately after the completion of the procedure there appears the opposite trend in the shift of the EKO, which is again significantly different from the changes during the same period after the simulated procedure was completed.

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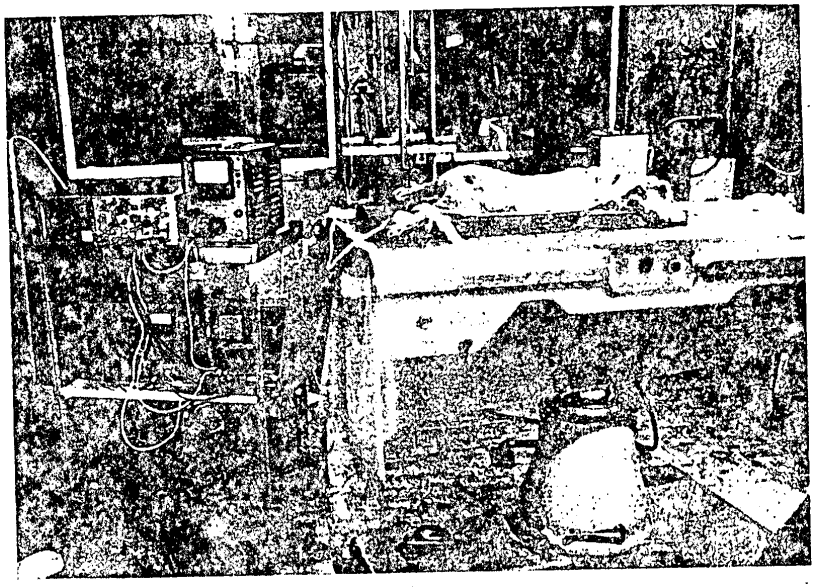

Figure 1. General view of the arrangement of the experiment when electronarcosis was administered to a rabbit by using the instrument ELECTROREL GJP.

Discussion

Our first experiments and the set of our clinical experiments indicate unequivocally that electronic noise as well as magnetic fields affect the organism and the mind of a person. Changes in the EKV (or opposite changes of the EKO) indicate that there is a growing predominance of the parasympathetic nerve, and they follow a decrease of vigilance. In this connection, one can also mention the observations made by Serdyukovo, which show that internal nervous activities are dampened by the activity of the magnetic field, as well as the findings made by Asabayev, which point out that there is a synchronizing reaction of the EEG [electroencephalogram] (that is, an increase of the index of slow waves and formation of small spindles), also under the effect of the magnetic field (1, 31). Atayev demonstrated then that a modulated magnetic field with frequency of 20 to 100 cycles per second is a factor which causes a conditional protective-adaptive reflex in cats. Bankov brought about a condition of sleepiness in animals by using a low-frequency modulated magnetic field, and he also demonstrated the existence of this condition by studying the findings

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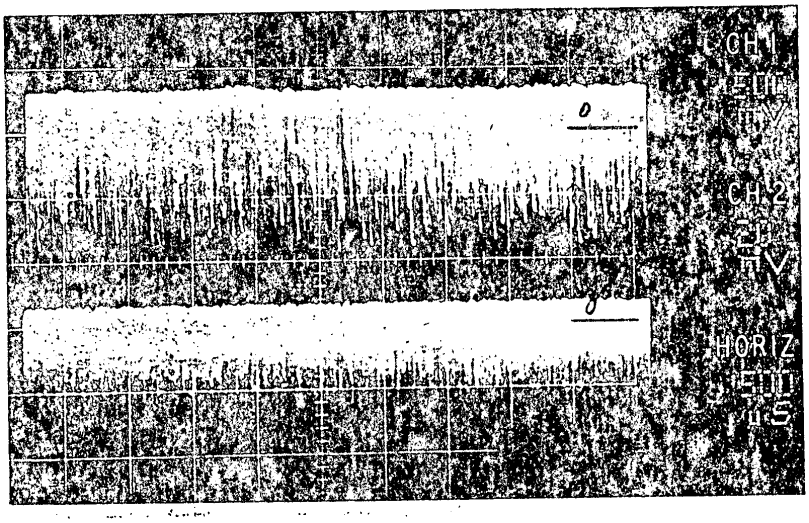

Figure 2. Oscillogram of noise signals. CH 1: applied current, CH 2: voltage at needle-type electrodes inside of the rabbit's brain.

of the EEG, by evaluating the activity of the heart, breathing, and last but not least also by evaluating the changes of constant potentials of the rabbit's brain (2). An increase of changes of steady potentials in the brain is considered as a proof of the increasing dampening in the cerebrum (2). This process can be recorded today even in color (28) (see Figures 4, 5). All this is also a proof of the fact that electrophysiology has found a correlation for the shifts of dampening phenomena in the central nervous system, which were assumed to exist by the Pavlov's and Hrbek's schools, and so it disproves objections which have been voiced in that respect (38).

We also concentrated on the application of modulated electromagnetic signals consisting of filtered EEG records of a patient. Activities left by the filter (activities which were smaller than the frequency of 11 cycles per second) were to modulate very high frequency electromagnetic waves, and by means of contactless electrodes return the signal adjusted in this way back to the patient's brain. However, in another official report

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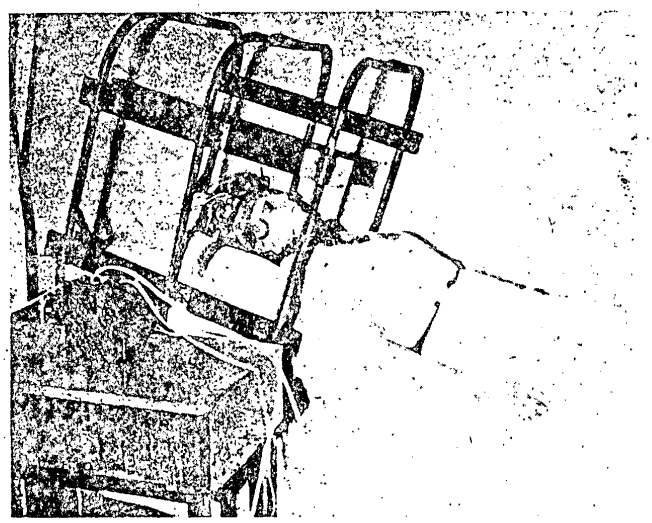

Figure 3. Cerebral application of a constant magnetic field (0.73 Oe) by means of three quadrangular coils (MAGNETOREL 1)

by an expert we were informed that the same effect can be obtained by administering impulse current cerebrally. It is obvious that this information was illusory, because it overlooked the possibility that the EEG signal may propagate by means of contactless electrodes and all the other opportunities which ensue from this method.

But even the studies which we were able to make so far and about which we have submitted our reports, are on the whole a proof of the fact that there exist in the organism electrophysiological systems which can receive electric and magnetic signals by means of indirect or direct semiconducting structures, which are most likely at the subcellular level (3), and possibly at the cellular level (6, 26). They can be demodulated and amplified up to the range of 10^6. Indeed, only then can the captured signals be the source of excitation which passes through the nervous structures. The development in this area offers great prospects of utilization of electromagnetic impulses for purposes of medical treatment. The process of influencing conditional reactiveness of the organism as well as the influencing of sleeplessness, neurotic and other difficulties, and also of the behavior of a person is not a minor matter.

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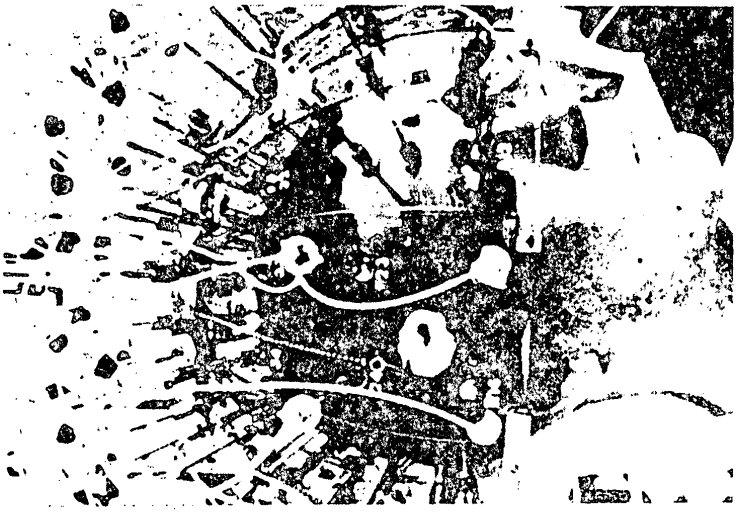

Figure 4. Electrodes and masks made of plastic, used to capture steady potentials. The mask is ready for use and is merely attached to the head. A pressure spiral makes it possible to maintain steady contact of the electrodes. The measuring period is 3 minutes.

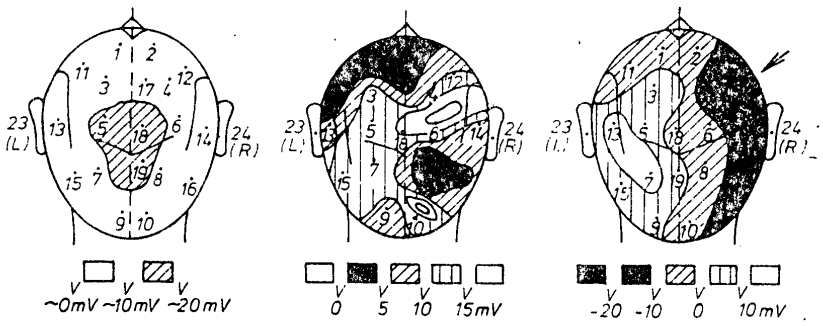

Figure 5. An example of a reading obtained by the instrument from diagram 8 [sic, Fig. 4?]. Differential potentials in a normal, organically unchanged brain (left), meningioma (middle) and brain contusions (right).

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We mentioned in the preceding paragraphs an official evaluation given by experts on the subject of the diathermic effect of electronic noise dated 9 March 1973. This opinion was changed on the basis of additional studies, and on 2 July 1975 (F-559-24 June 1975) the Ministry of Health of the Czech Socialist Republic recognized the method which we had proposed of treating insomnia and neuroses by using electronic noise as being a new method of treating the sickness. We believe that the official stand will be also changed in the case of the instrument used for transcerebral application of modulated electromagnetic signals, and that we will be granted financial assistance to develop this instrument as well. We know that it takes a long time to change classic view. But we are at the threshold of an era when the reception of random frequencies of electrons (that is, electronic noise) or reversely cool emission of electrons by biological entities---cannot be neglected in the area of research as well as in clinical treatment.

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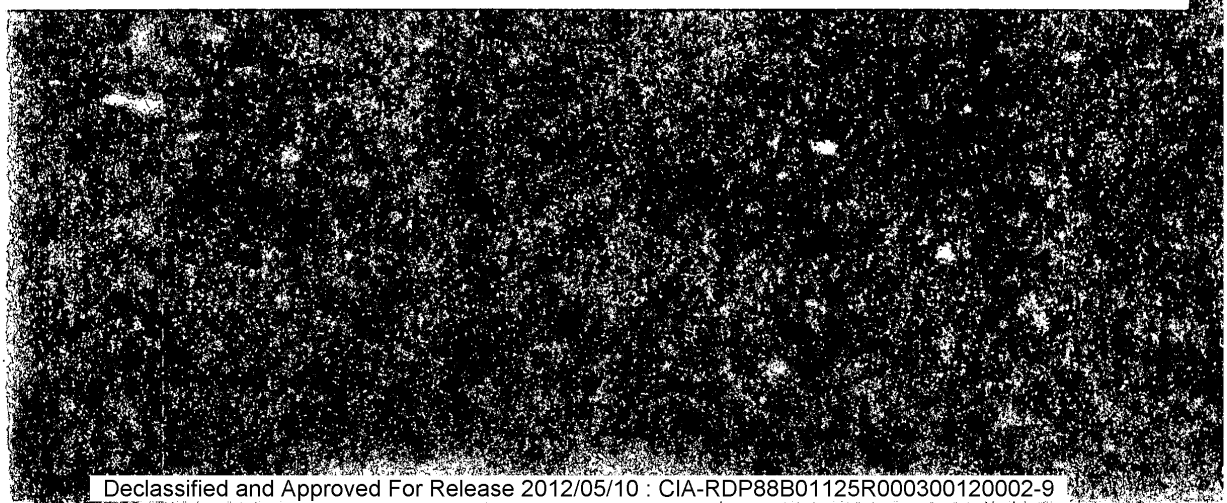

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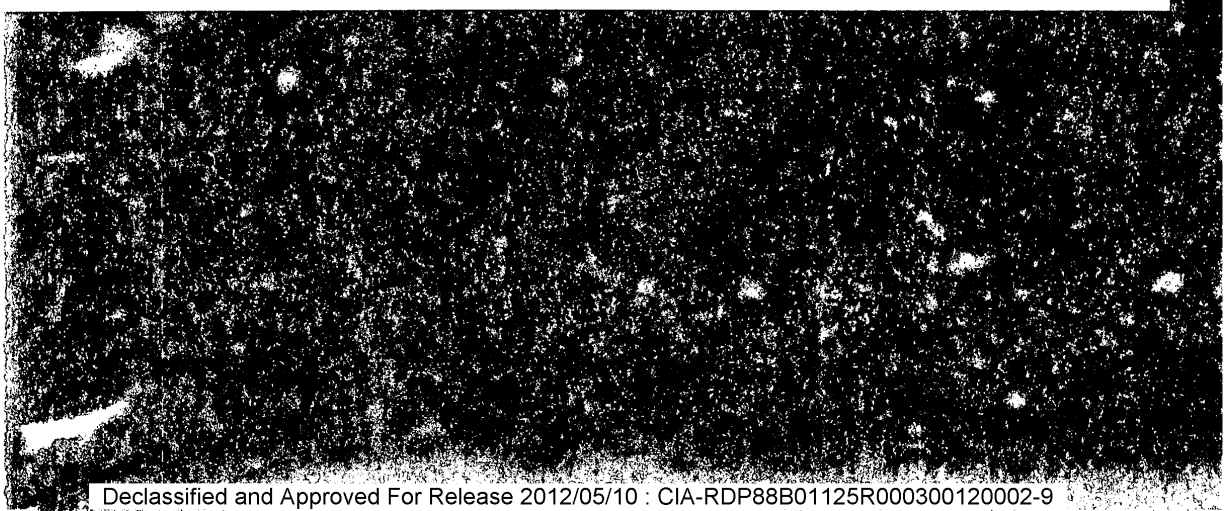

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SCIENTIFIC ABSTRACTS
CYBERNETICS, COMPUTERS, AND
AUTOMATION TECHNOLOGY

CONTENTS PAGE

Computers:Digital 18
Miscellaneous 19

Declassified and Approved For Release 2012/05/10 : CIA-RDP88B01125R000300120002-9

Declassified and Approved For Release 2012/05/10 : CIA-RDP88B01125R000300120002-9

COMPUTERS:DIGITAL

CZECHOSLOVAKIA

VRABEC, Vladimir, Computer Department, Faculty of Electrical Engineering, Czech Technical University, Prague

VIRTUAL SYSTEMS

Bratislava INFORMACNE SYSTEMY in Czech Vol 5, No 1, Mar 76 pp 81-91

[Abstract] The concept of virtual systems, virtual memories, and virtual computers was brought about by the shortcomings shown by computers of the so-called third generation. Design of virtual memories is suitable for the solution of dynamic assignments of operational memories; design of virtual computers led to the possibility of using several operational systems on a single real computer. In virtual systems dynamic requirements may be observed when operational memory is assigned to individual users. The logical memory medium of a computer is its virtual memory. The British computer ATLAS was one of the first units with a virtual memory. It is important to avoid overflowing of the memory. The real computer is assigned the role of a host computer with the real computer providing the instructions for the virtual computer. The real host computer may simulate in parallel several virtual computers. The first virtual computer was the IBM M44/44X unit
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CZECHOSLOVAKIA

VRABEC, Vladimir, INFORMACNE SYSTEMY Vol 5, No 1, Mar 76 pp 81-91

with multivirtual memory. The IBM System /360 Model 30 uses the Hierarchical Control Program in the virtual computer. Most of the virtual systems use the Control Program - 67,or CP-67. With respect to the central unit of a virtual computer the supervisor of the host system operates in the privileged mode, while other programs operate in the nonprivileged mode. In most practical applications, the CP-67 is used together with the Cambridge Monitor System. The main advantage of virtual systems is the fact that a real host computer may be used in parallel by several users for various operating systems. When the operating systems of the host systems are of the single program concept, all functions needed for parallel use of the host system are concentrated in the control program. At present, application of the concept of virtual computer systems is being studied for use in TESLA-200 computers. Results of this study will be published at a later date. References 16: all Western.

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CZECHOSLOVAKIA

Author not given

SYMPOSIUM OF MODELING AND HYBRID TECHNOLOGY AT ROSTOCK, EAST GERMANY

Prague AUTOMATIZACE in Czech No 3, 1976 pp 56 & 57

[Abstract] A Symposium on Modeling and Hybrid Technology was held at Rostock, East Germany, on 10 to 12 December 1975. Prof Sydow chaired the meetings. Dr Wilfert of the East German Academy of Sciences presented his work on experimental analysis of processes and design of dynamic models. Dr Kraus, also of the Academy, discussed modeling of psychic processes. In addition, three sections of the Symposium dealt with specialized subjects. In section A, modeling of biological problems was discussed. Dr Bergter of Jena dealt with modeling in microbiology. M. Kotva of Czechoslovakia discussed modeling of complex multicompartment medical systems. Dr Bellman of Berlin reviewed algorithms for simulating molecular genetic information systems; Dr Cumme of Jena discussed modeling of biochemical networks. Section B dealt with hybrid computer technology. H. Adler of Dresden described a new simple integrator; Jackisch of Dresden presented a method of fast calculation of functional processes in systems with three

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CZECHOSLOVAKIA

AUTOMATIZACE No 3, 1976 pp 56 & 57

independent variables. K. Kabes of Czechoslovakia described the Czechoslovak computers ADT 3000, ROBOTRON PRS 4000, and the HRA 7000, and GTP HRA 7000 systems. Grauner of Dresden discussed the REVO program and the hybrid system HRA 4241. Huber and Schroder of Ilmenau discussed the AVOR and HYBI programs. Paluszinski of Poland described the computer TELEFUNKEN RA 743 and the program PDP 9 - LOCUST. Cemus of Czechoslovakia described the computers ADT 3000 and ADT 7000. Schonfeld of Ilmenau described the DS 4000 program developed for the Czechoslovak computer PRS 4000. Fiala of Czechoslovakia described a new Czechoslovak computer--the MEDA 41 TC. Section C dealt with numerical simulation of technical systems. Otto of Dresden described some simple models for investigation of systems with expanded parameters suitable for study of electrical circuits. Reibiger of Dresden reviewed several parameters important in computer analysis of electrical circuits.

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